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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/809,896	03/26/2004	Yoshio Takasu	70728-011	7805

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MCDERMOTT, WILL & EMERY
600 13th Street, N.W.
WASHINGTON, DC 20005-3096

EXAMINER

ZIMMER, ANTHONY J

ART UNIT	PAPER NUMBER
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1793

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/809,896	Applicant(s) TAKASU ET AL.	
	Examiner ANTHONY J. ZIMMER	Art Unit 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 December 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 3, 5-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 3, 5-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed on 12/20/2007 have been fully considered but they are not persuasive.
2. Applicant alleges that in the previous office action the examiner asserted that the process of claim 7, that is parts (a) – (d) is identically found in the Takasu reference.
3. However, as can be seen on page 5, lines 4-5 of the office action of 8/20/2007, the examiner states "Hereafter, this process as described in claim 7 part (a) and further limited by claim 9 will be referred to as the "nanosheet forming process." Therefore, statements later in the action saying that the process of the Takasu reference is identical to the nanosheet forming process, compare Takasu only to claim 7 part (a) as modified by claim 9 (the heating temperature).
4. Applicant argues since Takasu does not teach the process steps (c) and (d) of claim 8, that a ruthenic acid nanosheet of less than 1 nm is not formed.
5. However the ruthenic acid nanosheet is produced after mixing ruthenium oxide and an alkali metal compound and sintering or melting the mixture. This is noted by applicant several times in the application most notably in claim 7 part (a) where the claim recites "mixing ruthenium oxide and an alkali metal compound and sintering or melting the resulting mixture *to obtain a layered alkali metal-ruthenate compound containing a ruthenic acid nanosheet having a thickness of not more than 1 nm.*"

Applicant argues that since Takasu allegedly teaches against “using a nanosheet using the process of transforming the ruthenium oxide particles into a layered structure” that the present invention is not obvious in view of Takasu.

However the examiner did not reject claims under 35 USC 103 as being obvious over Takasu, but made a rejection using anticipation under 35 USC 102.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 3, 5-6, and 13 are rejected under 35 U.S.C. 102(b) as anticipated by Takasu et al, as cited in the previous action.

3. Claim 1 is drawn to a ruthenic acid nanosheet having a thickness of less than 1 nm. Takasu et al (hereafter, Takasu) describes a process for making a layered ruthenium oxide compound by melting ruthenium oxide and potassium hydroxide at 600°C, see section 3.5. Although Takasu does not explicitly mention a ruthenic acid nanosheet having a thickness of 1 nm or smaller, it necessarily flows from the given process and one of ordinary skill in the art would have envisaged at the time of the invention that the product of the process of Takasu contains a ruthenic acid nanosheet with a thickness of less than 1 nm.

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4. In claim 9 (referring to claim 7 part (a)) applicant describes an identical process to that of Takasu in which an alkali metal hydroxide and ruthenium oxide are melted at 500°C - 700°C to form a ruthenic acid nanosheet with a thickness of less than 1 nm. Hereafter, this process as described in claim 7 part (a) and further limited in claim 9 will be referred to as the “nanosheet forming process.” Takasu admits that the compound formed in the process described in Takasu has a layered structure that has not yet been well characterized, see section 3.5. However, a product of the nanosheet forming process is characterized on page 20-21 in the instant application and is found to have ruthenium oxide nanosheet(s) with a thickness of less than 1 nm, see page 21 lines 14-16 and claim 9. Since the process of Takasu is identical to the nanosheet forming process of instant application, one of ordinary skill in the art at the time of the invention would have envisaged that Takasu necessarily produces a product containing ruthenic acid nanosheets with a thickness of less than 1 nm.

5. Furthermore, Takasu describes the product of the nanosheet forming process having a formula of K_xRuO_y which is the same formula as $[RuO_{2+0.5x}]^{x-}$ in an alternative representation, see section 3.5. Also, since the process of Takasu is identical to that of the nanosheet forming process of the instant application, one of ordinary skill in the art would have envisaged at the time of the invention that the nanosheets formed in Takasu would necessarily have the same chemical formula.

6. Claim 3 is drawn to a layered ruthenic acid compound comprising a layered structure of the ruthenic acid nanosheets having an X-ray diffraction peak intensity at a (00L) plane ($L = 1$ to n when $0 \leq \theta(CuK\alpha) \leq 90^\circ$, n is determined depending on a basal

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interplanar spacing and $5 \leq n \leq 35$). Takasu describes forming the compound K_xRuO_y with a layered structure, see section 3.5, first paragraph, lines 2-5. The instant application characterizes the product of the nanosheet forming process and finds an X-ray diffraction peak intensity at a (00L) plane ($L = 1$ to 6 when $0 \leq \theta(CuK\alpha) \leq 90^\circ$, see figure 3. Since the process of Takasu is identical to that of the nanosheet forming process of the instant application, one of ordinary skill in the art would have envisaged at the time of the invention that the product formed in Takasu would necessarily have the same X-ray diffraction pattern.

7. Claim 5 is drawn to a colloidal ruthenic acid compound containing the ruthenic acid nanosheet of claim 1. Takasu describes a process of adding the K_xRuO_y described above (a layered ruthenic acid compound) to an aqueous solution of HCl (a solvent) which would necessarily form a colloidal ruthenic acid compound, see section 3.5.

8. Claim 6 is drawn to an electrochemical device having an electrode comprising the ruthenic acid nanosheet in accordance with claim 1. Takasu teaches making an electrode from H_xRuO_y , (a compound containing the ruthenic acid nanosheets as described above) by coating the compound on a titanium sheet with a PTFE dispersion, thereby forming an electrochemical device having an electrode, see section 3.5.

9. Claim 13 is drawn to a ruthenic acid compound in accordance with claim 3 and a solvent. Takasu describes a process of adding the K_xRuO_y described above (a layered ruthenic acid compound) to an aqueous solution of HCl (a solvent), see section 3.5.

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7. Claims 7-8, and 10-12 are rejected under 35 U.S.C. 102(a) as being anticipated by Sugimoto et al. (see PTO-892 for citation).

8. Sugimoto teaches mixing potassium carbonate and ruthenium oxide and heating at 850°C and then treating the product of the above step with an acid and then reacting the product with ethylamine (an alkylamine) or tetrabutylammonium hydroxide (an alkylammonium compound) in order to produce an ethylammonium-layered ruthenic acid intercalation compound and then dispersing (mixing) said ethylammonium-layered ruthenic acid intercalation compound with water. See Experimental Section, on page 4230.

9. In the above process, the products of each step as specified in claim 7 would necessarily be produced (i.e. the ruthenic acid nanosheet with a thickness less than 1 nm in step (a), the protonic layered ruthenic acid hydrate in step (b), the ethylammonium-layered ruthenic acid intercalation compound in step (c), or the colloid containing a ruthenic acid nanosheet with a thickness less than 1 nm in step (d)) as the process steps of Sugimoto are substantially similar to those of the instant claim, and thus would produce substantially similar products. See MPEP 2112.01.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

12. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sugimoto as applied to claim 7 above, in view of Takasu.

13. Sugimoto does not teach heating the ruthenium oxide and alkali metal hydroxide at a temperature of 500-700°C.

14. However, it would have been obvious to one of ordinary skill in the art to modify Sugimoto in view of Takasu as Takasu teaches heating ruthenium oxide and potassium hydroxide at 600°C in order to produce a layered ruthenium oxide compound. See Takasu, Section 3.5 on page 4140. One of ordinary skill in the art would have been motivated to import the heating temperature of Takasu into the process of Sugimoto in order minimize energy expenditures by heating at a lower temperature.

15. **Conclusion**

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US2002/0028173 describes a process of forming ruthenic oxide using an alkyl amine. See paragraphs [0032]-[0033], [0064]-[0065], and [0290].

US5897912 and US4261602 both describe processes of producing electrodes that involve alkylammonium or alkylamines, and ruthenium.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANTHONY J. ZIMMER whose telephone number is (571)270-3591. The examiner can normally be reached on Monday - Friday 7:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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/Steven Bos/
Primary Examiner, Art Unit 1793